

What is claimed is:

1 1. A fixed length data processing apparatus
2 for processing fixed length data used for an
3 asynchronous communication to which transmission
4 route identification information different from
5 transmission route to transmission route is set, said
6 fixed length data processing apparatus comprising:
7 a registration information holding unit for
8 holding registration information necessary to
9 identify fixed length data that is an object of a
10 processing commonly to said transmission routes; and
11 a data processing unit for identifying
12 whether received fixed length data is fixed length
13 data that is an object of a processing or not on the
14 basis of at least said registration information in
15 said registration information holding unit to perform
16 a data processing for fault management in said
17 asynchronous communication on the basis of said fixed
18 length data when identifying that said fixed length
19 data is fixed length data that is an object of a
20 processing correspondingly to said transmission
21 route.

1 2. The fixed length data processing apparatus
2 according to claim 1, wherein said data processing
3 unit performs said data processing according to a

4 process timing in synchronization with a length of
5 said fixed length data.

1 3. The fixed length data processing apparatus
2 according to claim 1, wherein when a plurality of fixed
3 length data are handled in a plurality of transmission
4 apparatus, respectively, said data processing unit
5 performs said processing commonly to said
6 transmission apparatus on the basis of apparatus
7 identification information unique to said
8 transmission apparatus.

1 4. The fixed length data processing apparatus
2 according to claim 1, wherein said data processing
3 unit comprises:

4 a termination information holding unit for
5 holding termination information necessary to
6 identify fixed length data that is an object of
7 termination to be terminated among fixed length data
8 that are objects of the processing commonly to said
9 transmission routes;

10 an identifying unit for identifying whether
11 received fixed length data is data that is at least
12 an object of the processing and an object of
13 termination, and is alarm data for notifying of an
14 alarm state of said transmission route or not
15 correspondingly to said transmission route on the

16 basis of the information in said registration
17 information holding unit and said termination
18 information holding unit;
19 an alarm managing unit for holding and
20 managing alarm state information on said transmission
21 route correspondingly to said transmission route on
22 the basis of said alarm data when said identifying unit
23 identifies that said fixed length data is said alarm
24 data;
25 an alarm data generating unit for generating
26 alarm data to be notified another fixed length data
27 correspondingly to said transmission route on the
28 processing apparatus basis of said alarm state
29 information held and managed correspondingly to said
30 transmission route in said alarm managing unit; and
31 an inserting process unit for inserting said
32 alarm data generated by said alarm data generating
33 unit to an empty region in a flow of fixed length data
34 that is identified by said identifying unit that said
35 fixed length data is not required to be terminated and
36 should be passed through toward said another fixed
37 length data processing apparatus.

1 5. The fixed length data processing apparatus
2 according to claim 4, wherein said registration
3 information holding unit is configured with a RAM.

1 6. The fixed length data processing apparatus
2 according to claim 4, wherein said registration
3 information holding unit holds said registration
4 information according to an address based on at least
5 said transmission route identification information,
6 said identifying unit comprises an address generating
7 unit for generating an address based on transmission
8 route identification information on a received fixed
9 length data; and
10 wherein said fixed length data processing
11 apparatus designates an address generated by said
12 address generating unit to said registration
13 information holding unit to read registration
14 information necessary to identify said received fixed
15 data from said registration information holding unit.

1 7. The fixed length data processing apparatus
2 according to claim 6, wherein said address generating
3 unit uses a part of said transmission route
4 identification information according to the number of
5 digits of an address of said registration information
6 holding unit to generate an address to be designated
7 to said registration information holding unit.

1 8. The fixed length data processing apparatus
2 according to claim 4, wherein said termination
3 information holding unit is configured with a RAM.

1 9. The fixed length data processing apparatus
2 according to claim 4, wherein said termination
3 information holding unit uses a part of said
4 transmission route identification information as an
5 address indicating a position in which said
6 termination information is stored.

1 10. The fixed length data processing apparatus
2 according to claim 4, wherein said transmission route
3 is designated by a virtual path and a virtual channel
4 belonging to said virtual path; and
5 wherein said alarm managing unit comprises:
6 a virtual path alarm state holding unit for
7 holding alarm state information on said virtual path
8 correspondingly to apparatus identification
9 information unique to transmitting apparatus; and
10 a virtual channel alarm state holding unit for
11 holding alarm state information on said virtual
12 channel correspondingly to said apparatus
13 identification information.

1 11. The fixed length data processing apparatus
2 according to claim 10, wherein said virtual path alarm
3 state holding unit and said virtual channel alarm
4 state holding unit are configured with RAMs.

1 12. The fixed length data processing apparatus
2 according to claim 10, wherein said alarm managing
3 unit comprises a canceling process unit being able to
4 cancel said alarm state information in said virtual
5 path alarm state holding unit and said virtual channel
6 alarm state holding unit.

1 13. The fixed length data processing apparatus
2 according to claim 12, wherein each of said virtual
3 path alarm state holding unit and said virtual channel
4 alarm state holding unit holds elapsed time
5 information about a time elapsed since said alarm
6 state information is held and said alarm state
7 information in combination; and

8 wherein said canceling process unit monitors
9 said elapsed time information in said virtual path
10 alarm state information holding unit and said virtual
11 channel alarm state holding unit to cancel alarm state
12 information held over a predetermined time.

1 14. The fixed length data processing apparatus
2 according to claim 12, wherein said canceling process
3 unit cancels said alarm state information in said
4 virtual path alarm state holding unit and said virtual
5 channel alarm state holding unit when said identifying
6 unit identifies reception of higher order alarm data
7 having a higher notification priority than said alarm

8 data.

1 15. The fixed length data processing apparatus
2 according to claim 10, wherein said virtual path alarm
3 state holding unit holds generation time information
4 defining a generate time interval for said alarm data
5 in said alarm data generating unit and said alarm state
6 information in combination; and
7 wherein said alarm data generating unit
8 generates said alarm data at predetermined time
9 intervals according to said generate time information
10 in said virtual path alarm state holding unit.

1 16. The fixed length data processing
2 apparatus according to claim 12, wherein said alarm
3 managing unit comprises a virtual path information
4 holding unit for holding information on a virtual path
5 to which a virtual channel that can be an object of
6 cancellation of said alarm state information in said
7 virtual channel alarm state holding unit belongs;
8 wherein when said fixed length data
9 processing apparatus receives alarm data for a virtual
10 path having information on said virtual path held in
11 said virtual path information holding unit, said
12 canceling process unit cancels alarm state
13 information on a virtual channel belonging to said
14 virtual path in said virtual channel alarm state

15 holding unit.

1 17. The fixed length data processing
2 apparatus according to claim 16, wherein said virtual
3 path information holding unit comprises a plurality
4 of RAMs, and divides information on said virtual path
5 into plural pieces to hold said information in said
6 plurality of RAMs correspondingly to a plurality of
7 virtual channel groups consisting of a plurality of
8 virtual channels; and

9 wherein said canceling process unit reads
10 information on said virtual path from said plurality
11 of RAMs within a predetermined cycle to collate
12 whether alarm data for said virtual path has
13 information on said virtual path held in said virtual
14 path information holding unit.

1 18. The fixed length data processing
2 apparatus according to claim 4, wherein said
3 registration information holding unit holds alarm
4 data generating information necessary to generate
5 said alarm data correspondingly to said transmission
6 route; and

7 wherein said alarm data generating unit
8 comprises an alarm state information detecting unit
9 for detecting said alarm state information held and
10 managed correspondingly to said transmission route in

11 said alarm managing unit, and an alarm data generating
12 information detecting unit for detecting alarm data
13 generating information necessary for said alarm data
14 to be generated on the basis of said alarm state
15 information detected by said alarm state information
16 detecting unit in said registration information
17 holding unit to generate said alarm data on the basis
18 of said alarm state information detected by said alarm
19 state information detecting unit and said alarm data
20 generating information detected by said alarm data
21 generating information detecting unit.

1 19. The fixed length data processing
2 apparatus according to claim 18, wherein when said
3 fixed length data is handled in a predetermined
4 transmitting apparatus, said registration
5 information holding unit holds said alarm data
6 generating information correspondingly to apparatus
7 identification information unique to said
8 transmitting apparatus; and

9 wherein said alarm state information
10 detecting unit and said alarm data generating
11 information detecting unit perform said information
12 detecting on the basis of said apparatus
13 identification information correspondingly to said
14 transmitting apparatus.

1 20. The fixed length data processing
2 apparatus according to claim 4, wherein said
3 identifying unit identifies whether received fixed
4 length data is data to be discarded or not; and
5 wherein said inserting process unit inserts
6 said alarm data generated by said alarm data
7 generating unit instead of fixed length data
8 identified as data to be discarded by said identifying
9 unit.

1 21. The fixed length data processing
2 apparatus according to claim 4, wherein when said
3 fixed length data is handled in a predetermined
4 transmitting apparatus, said inserting process unit
5 separately performs an inserting process to insert
6 said alarm data on the basis of apparatus
7 identification information unique to said
8 transmitting apparatus correspondingly to said
9 transmitting apparatus.

1 22. The fixed length data processing
2 apparatus according to claim 18, wherein said data
3 processing unit comprises an intervening control unit
4 for intervening duplication of at least an access
5 timing from said identifying unit to said registration
6 information in said registration information holding
7 unit and an access timing from said alarm data

8 generating unit to said alarm data generating
9 information in said registration information holding
10 unit according to predetermined priority.

1 23. A fixed length data processing apparatus
2 for processing fixed length data for asynchronous
3 communication comprising:

4 a request generating unit being able to
5 generate an execution request for a continuity test
6 processing in order to confirm a continuity state in
7 said asynchronous communication; and

8 a continuity test processing unit for
9 generating fixed length data for a continuity test
10 when receiving said execution request from said
11 request generating unit, transmitting and receiving
12 said fixed length data to and from another fixed length
13 data processing apparatus via said transmitting
14 apparatus to execute said continuity test processing,
15 and notifying a result of said continuity test
16 processing said request generating unit.

1 24. The fixed length data processing apparatus
2 according to claim 23, wherein said continuity test
3 processing unit performs said continuity test
4 processing according to a process timing in
5 synchronization with a length of said fixed length
6 data.

1 25. The fixed length data processing apparatus
2 according to claim 23, wherein when transmission route
3 identification information on transmission routes of
4 said fixed length data is set in a plurality of said
5 fixed length data handled by a plurality of
6 transmitting apparatus, said continuity test
7 processing unit performs said continuity test
8 processing commonly to said transmission routes on the
9 basis of said transmission route identification
10 information.

1 26. The fixed length data processing apparatus
2 according to claim 23, wherein when said fixed length
3 data is handled by a predetermined transmitting
4 apparatus, said continuity test processing unit
5 performs said continuity test processing
6 correspondingly to said transmitting apparatus on the
7 basis of apparatus identification information unique
8 to said transmitting apparatus.

1 27. The fixed length data processing apparatus
2 according to claim 23, wherein when fixed length data
3 for the continuity test received from said another
4 fixed length data processing apparatus is fixed length
5 data having been generated by its own fixed length data
6 processing apparatus requesting to be looped back,
7 looped back by said another fixed length data

8 processing apparatus and received, said continuity
9 test processing unit notifies said request generating
10 unit that said continuity state is normal as a result
11 of said continuity test processing.

1 28. The fixed length data processing apparatus
2 according to claim 27, wherein when fixed length data
3 for a continuity test received from another fixed
4 length data processing apparatus is data having been
5 generated in said another fixed length data processing
6 apparatus requesting to be looped back, said
7 continuity test processing unit loops back said fixed
8 length data to said another fixed length data
9 processing apparatus.

1 29. The fixed length data processing apparatus
2 according to claim 28, wherein said requesting
3 generating unit generates, in response to said
4 execution request, setting data for the continuity
5 test processing including at least generating data
6 necessary to generate fixed length data for said
7 continuity test and confirming data necessary to
8 confirm contents of fixed length data for the
9 continuity test received from another fixed length
10 data processing apparatus; and

11 wherein said continuity test processing unit
12 comprises:


13 an interface unit for receiving said setting
14 data from said request generating unit;
15 a setting data holding unit for holding said
16 setting data received by said interface unit;
17 a continuity testing data generating process
18 unit for generating fixed length data for the
19 continuity test on the basis of said generating data
20 in said setting data holding unit when receiving said
21 execution request from said request generating unit,
22 and transmitting said fixed length data to said
23 another fixed length data processing apparatus;
24 a confirming process unit for confirming at
25 least whether fixed length data for said continuity
26 test is loopback data that is fixed length data having
27 been generated in said continuity testing data
28 generating process unit requesting to be looped back,
29 looped back by said another fixed length data
30 processing apparatus and received, or loopback
31 requesting data having been generated in said another
32 fixed length data processing apparatus requesting to
33 be looped back, on the basis of said confirming data
34 in said setting data holding unit when receiving said
35 fixed length data for a continuity test from said
36 another fixed length data processing apparatus;
37 a notifying process unit for notifying said
38 request generating unit via said interface unit that
39 said continuity state is normal as a result of said

40 continuity test processing when said confirm
41 processing unit confirms that the received fixed
42 length data for a continuity test is said loopback
43 data; and

44 a loopback processing unit for performing a
45 loopback processing to loop back said fixed length
46 data for a continuity test to another fixed length data
47 processing apparatus as loopback data when said
48 confirming processing unit confirms that said
49 received fixed length data for a continuity test is
50 said loopback requesting data.

1 30. The fixed length data processing apparatus
2 according to claim 29, wherein said setting data
3 holding unit holds each of said data correspondingly
4 to transmission route identifying information on
5 fixed length data set in said fixed length data for
6 a continuity test.

1 31. The fixed length data processing apparatus
2 according to claim 30, wherein said setting data
3 holding unit is configured with a dual port RAM having
4 at least ports in two systems, said continuity testing
5 data generating process unit reads said generating
6 data through a port in either system of said dual port
7 RAM, and said confirming process unit reads said
8 confirming data through a port in the other system of



9 said dual port RAM.

1 32. The fixed length data processing apparatus
2 according to claim 29, wherein said continuity test
3 processing unit comprises a count data holding unit
4 for holding count data counted up in a predetermined
5 cycle when fixed length data for a continuity test
6 requesting to be looped back generated by said
continuity testing data generating unit is
8 transmitted, said confirming process unit monitors
9 said count data in said count data holding unit to
10 confirm whether said fixed length data for a
11 continuity test generated by said continuity testing
12 data generating unit is received from said another
13 fixed length data processing apparatus within a
14 predetermined time or not, and said continuity testing
15 data generating unit re-generates fixed length data
16 for a continuity test when said confirming process
17 unit confirms that said fixed length data for a
18 continuity test is not received within said
19 predetermined time.

1 33. The fixed length data processing apparatus
2 according to claim 32, wherein said confirming process
3 unit confirms the number of times of implementation
4 of said re-generating process by said continuity
5 testing data generating unit, and said notifying

6 process unit notifies said request generating unit
7 that said continuity state is abnormal as a result of
8 said continuity test when said confirming process unit
9 confirms that the number of times of implementation
10 of said re-generating process reaches a predetermined
11 number of times.

1 34. The fixed length data processing apparatus
2 according to claim 33, wherein said request generating
3 unit notifies of said predetermined number of times
4 said confirming process unit.

1 35. The fixed length data processing apparatus
2 according to claim 32, wherein said count data holding
3 unit holds said count data in the same address region
4 as an address region in which at least said confirming
5 data is held in said setting data holding unit, and
6 said confirming process unit reads said confirming
7 data and said count data by designating an address
8 region common to said setting data holding unit and
9 said count data holding unit to perform said
10 confirming process on the basis of each of said
11 confirming data and said count data.

1 36. The fixed length data processing apparatus
2 according to claim 32, wherein said setting data
3 holding unit holds said count data as a combination

4 of said generating data and said confirming data.

1 37. The fixed length data processing apparatus
2 according to claim 30, wherein said setting data
3 holding unit holds process state management data for
4 managing a process state of said continuity test
5 processing correspondingly to said transmission
6 route identification information, and said
7 continuity testing data generating unit, said
8 confirming process unit, said notifying process unit
9 and said loopback processing unit perform said
10 processing separately on each of a plurality of
11 transmission routes on the basis of said transmission
12 route identification information set in received
13 fixed length data for a continuity test and said
14 process state management data in said setting data
15 holding unit.

1 38. The fixed length data processing apparatus
2 according to claim 37, wherein said setting data
3 holding unit holds generation waiting display data
4 representing a waiting state for said fixed length
5 data for a continuity test as said process state
6 management data; and
7 wherein said continuity testing data
8 generating process unit comprises a generation
9 waiting identification information retrieving unit

10 for retrieving plural kinds of transmission route
11 identification information in which said generation
12 waiting display data is held in said setting data
13 holding unit, and a transmission route identification
14 information holding unit for holding plural kinds of
15 transmission route identification information
16 retrieved by said generation waiting identification
17 information retrieving unit to continuously generate
18 fixed length data for a continuity test for a plurality
19 of transmission routes on the basis of said plural
20 kinds of transmission route identification
21 information held in said transmission route
22 identification information holding unit.

1 39. The fixed length data processing apparatus
2 according to claim 29, wherein said continuity testing
3 data generating process unit sets at least time data
4 about a generate time of said fixed length data in said
5 generated fixed length data for a continuity test and
6 writes said time data as a part of said confirming data
7 in said setting data holding unit; and
8 wherein when the same time data as said time
9 data written in said setting data holding unit is set
10 in said fixed length data for a continuity test
11 received from said another fixed length data
12 processing apparatus, said confirming process unit
13 confirms that said fixed length data for a continuity

14 test is data having been looped back by said another
15 fixed length data processing apparatus and received.

1 40. The fixed length data processing apparatus
2 according to claim 29, wherein said request generating
3 unit gives a transfer trigger to said interface unit
4 in order to generate said setting data for each of
5 transmission routes of a plural kinds of fixed length
6 data that are objects of a continuity testing process
7 and transmit said setting data to said interface unit
8 or read said setting data from setting data holding
9 unit;

10 wherein said confirming process unit
11 collectively reads said setting data from said
12 interface unit and writes said setting data in said
13 setting data holding unit, or collectively reads said
14 setting data from said setting data holding unit and
15 sends said setting data to said interface unit with
16 said transfer trigger to said interface unit as an
17 opportunity.

1 41. The fixed length data processing apparatus
2 according to claim 40 further comprising a register
3 for holding said setting data from said request
4 generating unit to be held in said setting data holding
5 unit or said setting data read out from said setting
6 data holding unit commonly to transmission route

7 identification information set in said fixed length
8 data for a continuity test;

9 wherein said confirming process unit
10 comprises an address generating unit for generating
11 a part of an address showing a position in said setting
12 data holding unit in which said setting data held in
13 said register is written or a position in said setting
14 data holding unit from which said setting data is read
15 out with said transfer trigger as an opportunity; and

16 wherein said confirming process unit writes
17 said setting data in said setting data holding unit
18 or reads said setting data from said setting data
19 holding unit according to an address which is a
20 combination of a part of an address generated by said
21 address generating unit and an address set as a
22 remaining part of said address by said request
23 generating unit.

1 42. The fixed length data processing apparatus
2 according to claim 41, wherein said interface unit
3 inhibits an access from said request generating unit
4 while said setting data is written from said register
5 in said setting data holding unit.

1 43. The fixed length data processing apparatus
2 according to claim 29, wherein said fixed length data
3 processing apparatus comprises an error detecting

4 unit for detecting an error in said setting data from
5 said request generating unit, and a data correcting
6 unit for correcting said error when said error
7 detecting unit detects said error in said setting
8 data.

1 44. The fixed length data processing apparatus
according to claim 29 further comprising an inserting
3 unit for inserting said loopback data to be looped back
4 to said another fixed length data processing apparatus
5 in a loopback processing by said loopback processing
6 unit in an empty region in a fixed length data flow
7 toward said another fixed length data processing
8 apparatus.

1 45. The fixed length data processing apparatus
2 according to claim 44, wherein said inserting unit
3 comprises an input disconnection state detecting unit
4 for detecting an input disconnection state of said
5 fixed length data flow, and an alarm generating unit
6 for periodically generating alarm data for notifying
7 of a fault state said another fixed length data
8 processing apparatus when said input disconnection
9 state detecting unit detects said input disconnection
10 state;

11 wherein when said input disconnection state
12 detecting unit detects said input disconnection state,

13 said inserting unit inserts said loopback data in an
14 empty region in an alarm data flow periodically
15 generated by said alarm generating unit.

1 46. The fixed length data processing apparatus
2 according to claim 44, wherein said inserting unit
3 comprises a loopback data holding unit for holding
4 said loopback data, and said loopback data holding
5 unit holds only a part of data among said loopback
6 data.

1 47. The fixed length data processing apparatus
2 according to claim 46, wherein said inserting unit
3 generates additional data to be added other than said
4 part of data not held in said loopback data holding
5 unit at the time of the insertion to add said
6 additional data to said part of data held in said
7 loopback data holding unit at the time of the
8 insertion.

1 48. The fixed length data processing apparatus
2 according to claim 46, wherein when said inserting
3 unit is notified by said continuity test processing
4 unit that said loopback data is not data to be looped
5 back to said another fixed length data processing
6 apparatus, said inserting unit cancels said data held
7 in said loopback data holding unit.

1 49. The fixed length data processing apparatus
2 according to claim 44, wherein said inserting unit
3 comprises an intervening circuit for intervening
4 insert timings for said loopback data and said fixed
5 length data for insertion when fixed length data for
6 insertion to be inserted to an empty region in said
7 fixed length data flow exists other than said loopback
8 data for a continuity test.

1 50. The fixed length data processing apparatus
2 according to claim 49, wherein said intervening
3 circuit gives the highest priority to said insert
4 timing for said loopback data.

1 51. The fixed length data processing apparatus
2 according to claim 44, wherein when said fixed length
3 data for a continuity test is handled by a
4 predetermined transmitting apparatus, said inserting
5 unit separately performs said inserting process
6 corresponding to said transmitting apparatus on the
7 basis of apparatus identification information unique
8 to said transmitting apparatus.

1 52. The fixed length data processing apparatus
2 according to claim 51, wherein said inserting unit
3 performs the next inserting process on the basis of

4 apparatus identification information different from
5 said apparatus identification information by which
6 said inserting process has been performed in the last
7 occasion.

1 53. The fixed length data processing apparatus
2 according to claim 51, wherein said inserting unit
3 inhibits said inserting process correspondingly to
4 said transmitting apparatus.